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ABSTRACT

The use of microcomputers with online catalogs is a partnership that is gaining wide acceptance and leading to dramatic changes in how we think about online catalogs. There are two major ways in which microcomputers are used in an online catalog system: (1) the microcomputer provides all the computer support for the entire system, i.e., the microcomputer is the system; (2) the microcomputer is a replacement for the conventional or dumb terminal. This use of microcomputers changes significantly the architecture of online catalog systems. For the first time, library patrons may be linked directly to the online catalog without an intermediary. The intelligence and data storage of the system may be distributed to the most efficient and/or cost effective location. The programmability of the microcomputer makes it suitable for supporting new user-system interactions such as electronic bulletin boards, electronic mail, and various store-and-forward operations. Finally, the partnership of the microcomputer with telecommunications truly brings the world of information directly to the library user. For the first time ever, the "library without walls" is a reality. (MES)

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Changing How the Catalog is Used

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Emily Gallup Fayen

Paper presented at the American Library Association

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ABSTRACT

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Microcomputers are having a profound effect on the architecture of online catalog systems. For the first time, library patrons may be linked directly to the online catalog without any intermediary. The intelligence of the system as well as the data storage may be distributed to the most efficient and/or cost effective location. The programmability of the microcomputer makes it suitable for supporting new user-system interactions such as electronic bulletin boards, electronic mail, and various store-and-forward operations. Finally, the partnership of the microcomputer with telecommunications truly brings the world of information directly to the library user. For the first time ever, the "library without walls" is a reality, and information is as close as the nearest telephone.

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The use of microcomputers with online catalogs is a partnership that is gaining wide acceptance and which is leading to dramatic changes in how we think about online catalogs. There are two major ways in which microcomputers are used in an online catalog system. The first way is for systems in which the microcomputer provides all the computer support for the entire system; that is, the microcomputer is the system. Numerous microcomputer-based library catalog systems are now being marketed such as Bib-base, Datatrek, Card Datalog, and the like. A recent issue of Library Technology Reports features a report by Joseph R. Matthews and Associates describing these systems and comparing their characteristics (1). The second way in which microcomputers are used with online catalogs is as a replacement for the conventional or dumb terminal. This use of microcomputers changes significantly the architecture of online catalog systems.

When online catalogs first started to appear in the early 1970s, virtually all of them involved the use of a large mainframe or minicomputer with a few terminals, dedicated to the library application, located in the library for public and staff use. Occasionally, one or more dial-up ports might be reserved for external use. As microcomputers became more powerful and less costly, software

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became available for them which allowed them to be used as stand-alone online catalogs; that is, the microcomputer with perhaps a hard disk attached and perhaps a printer and barcode reader supported the entire application. For the first time ever, it became possible for small libraries to afford library automation.

Microcomputers were not generally used as replacements for the terminals used with online catalogs until quite recently. In a few very early systems (2) a microcomputer was used to develop a user-friendly interface for an online catalog that was running on a minicomputer. This architecture was adopted not to take advantage of the capabilities of the microcomputer, but to find a way around the limitations of the telecommunications of the time. In the past few years, we have seen a move away from online catalogs built around a central mainframe or minicomputer with terminals attached, either directly or remotely, to systems that are based on distributed architecture. Not only are microcomputers frequently used as terminals (or workstations) on such systems, but the monolithic central computer is being replaced by groups of microprocessors working together to support the online catalog system. The Carlyle system (3) is a good example of this approach. Although there is no reason why (in most instances) terminals could not continue to be used instead of microcomputers to support the online catalog application, microcomputers can help to manage the telecommunications more easily and can be used to take some of the computational burden off the central processor.

Using microcomputers with online catalogs, especially where they replace conventional terminals, is having a profound effect on the architecture and use of online catalog systems. The microcomputer,

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partnered by a modem and phone line, is one of the most versatile devices to appear in many years. It will have a profound effect on the future development of online catalog systems. There are five major areas where change is inevitable:

1. For the first time, library patrons are able to use online catalogs, directly and by themselves, from a wide variety of remote locations. No longer is it necessary for users to work with a librarian to conduct a search of the online catalog or even to come to the library. Microcomputers have aided this move by providing an easy telecommunications path and by encouraging development of user-friendly interfaces to the host systems. It is forcing libraries to come to grips with the question of the end-user and to begin to re-think traditional library services in the light of the new technology.

Librarians have been quick to adopt the microcomputer as a new tool for user education and are busy developing computer aided instruction packages and other helping systems for their patrons and staff. But many librarians are clearly worried that users will no longer need them or that left to their own devices, they will miss vast resources.

2. Intelligence can be added at the most appropriate point. Because the microcomputer can be programmed to do certain things, the so-called intelligence of the system can be distributed to the most appropriate point. In older systems, the terminals served as little more than data input/output devices. They accepted user data entered at the keyboard and transmitted to the central computer. Alternatively, they received data sent from the central processor and displayed on a CRT or some

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other device for the user, but aside from some validation of the integrity of the data stream, all the "smartness" of the system resided at the host computer. For example, suppose the patron entered:

FIND AUTHOR * SHAKESPEARE (the "*" should be "=")

The message would be passed all the way to the central computer (maybe thousands of miles away), the host computer would evaluate the message, find a syntax error (the "*"), and send a message back to the terminal, hopefully something pleasant and instructive like:

"*" invalid here. Did you mean "="? Please re-enter your search or type HELP for more information.

However, much of this type of validation and error checking could be done by the microcomputer, thus relieving the host of a great deal of processing, and eliminating the time-consuming (and often expensive) transmission of erroneous entries and responses.

Microcomputers can also be used to support user-friendly interfaces with menus, pop-up windows, and other innovative data entry techniques such as the mouse. It is well known that much of the time elapsed in any online session is taken up by user think time, time required for data entry, and time required to read the menus and other system instructions, decide what to do, and then enter whatever data are needed to complete the session. Microcomputers can be used to support all of these functions while at the same time eliminating the need to send and receive a great deal of information from the host computer.

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Microcomputers can be used to support a common command language or to support various "gateway" systems by providing a place to perform the necessary translations from a common user dialogue to the formats required by the various host systems. Alternatively, the microcomputer can be used to translate the responses from one or more host systems to messages that are familiar to the user.

Microcomputers can also be used as integral components of the Linked Systems Project (LSP). This project has as its goal the transmission and sharing of bibliographic and authority records in MARC format among multiple systems. The microcomputer, because of the versatile ways in which it can handle telecommunications, can act as a link between two or more otherwise incompatible systems.

Of course, some functions may always have to reside at the host computer, for example Boolean keyword retrieval over very large files and sorting of large lists, require storage and processing power that are beyond the capabilities of all but the most powerful of today's microcomputers. Thus some of the system intelligence may always reside at the host and certain types of processing may always (and most appropriately) take place there. Other functions such as computer aided instruction, assistance in search strategy formulation, saving of search strategies for SDI or other uses, and downloading of citations for subsequent processing may most conveniently be accomplished at a microcomputer workstation on the system.

Much has been written about Expert Systems, the Scholar's Workstation, and other schemes to make intelligence available to the end-user. While these ideas are intriguing, it will be many years before we see true intelligent front ends for our online catalogs, either running on microcomputers or on larger machines. We simply do

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not yet know enough about some of the underlying concepts to build anything very useful. Of course, certain limited disciplines such as parts of medicine where the vocabulary is very precise and rules of inference may be laid down are starting to appear in Expert Systems, but in general, intelligent front ends are beyond us for some time to come.

A decade or so ago, people thought it ought to be easy to make a computer terminal that could understand spoken instructions. After --many years of hard work and millions of research dollars, we now have devices that can accept written text and produce synthetic speech, and there are even devices that can understand spoken commands in quite limited settings. But perhaps most importantly, we have learned something about the true complexity of the problem, and now can readily understand why no quick and easy solution appeared.

The special appeal of microcomputer-based online catalog systems is that we can now exploit what little true artificial intelligence capabilities we may have by locating them at the most appropriate point in the system, thus providing users with expert assistance in selecting the most appropriate databases, preparing search strategies, modifying search strategies based on relevance feedback, and so forth.

3. Data storage can take place at the most appropriate point. Online systems that offer remote access to users and to databases must make a tradeoff between the cost of online storage and the cost of telecommunications to a remote data store. Adding microcomputers to the online catalog systems architecture makes it easier to optimize the storage/telecommunications tradeoff because in many instances, the data can be located near its potential users.

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For example, consider the data storage needs of a large library. An online catalog of local holdings is needed so that users can tell what materials the library owns or has available for loan. Since optical storage media are now read-only, some type of magnetic store is most appropriate for this information because it can change frequently. It makes sense to have this information stored locally where its use is the heaviest, thus cutting down on telecommunications costs.

The online catalog may be linked to a large bibliographic utility such as OCLC, RLG, WLN, UTLAS, and so forth for access to shared cataloging data. In this case, the shared data files are extremely large and each library needs only a small portion of the total database. Thus, it makes sense to store the data centrally and have libraries call it up as needed. Of course, optical disk and cd-rom are starting to provide an alternative method of getting these records. Because the bibliographic files are largely archival, optical storage media can be used advantageously to store them. The cost tradeoff here is between the costs of maintaining a large, central data store that is called up from numerous remote locations, each of which pays telecommunications charges, and the costs of producing and replicating an optical disk containing all the data.

In addition, libraries can augment their files of cataloging data with records for journal articles, abstracts, citations, full text files, and the like. Some of these files are available via dial-up access to an online vendor such as Dialog or BRS while others are becoming available on cd-rom for local use. The cost tradeoff here is the subscription price of the cd-rom or other data file compared with the cost of online access. The advantage to libraries of optical data stores are two-fold: 1) publications on cd-rom are generally offered

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as subscriptions, thus making it easy for libraries to find a convenient way to acquire these new products, and 2) the annual cost is the same regardless of how much (or how little) the data files are used, thus making it easy for libraries to budget for these new services.

Finally, microcomputers can be used to create databases or files of local information such as an electronic bulletin board, community events calendar, ready reference, special bibliographies, pamphlet collections, vertical files, and so forth. These files may be available for staff use only (as in some applications for special collections) or for public use.

4. Microcomputers used with online catalogs support new user-system interactions. The intelligence and data storage capabilities of today's microcomputers allow them to be used to support a wide variety of auxiliary functions in conjunction with online catalog systems. For example, microcomputers can be used to forward interlibrary loan requests to some central location for processing. Patrons can place their own hold requests for items which are in circulation, and conceivably can request that the materials they want will be delivered to them when they are available.

In areas where telecommunications are extraordinarily expensive, search strategies may be batched and forwarded to another location for processing during off-peak hours. Patrons may also be able to create and store their own Selective Dissemination of Information (SDI) profiles for periodic use with one or more remote databases. A library may also use the interactive features of an online catalog with microcomputer workstations to support more dialogue between

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patrons and staff. For example, an online consultation service could be implemented wherein a patron logged on to the system could send an online inquiry or request for help to a librarian. The two may then carry on a conversation using the system's electronic messaging facilities to assist the user in locating the desired information. If maintaining such an online consulting service would place too great a burden on library staff members, an electronic suggestion box may be set up for users. By this means, patrons can submit suggestions, comments, questions, or ideas to the library staff for review. If the patron leaves an electronic mailbox address or other contact point with the suggestion, the library staff can respond when time permits.

Broadcast facilities located at the central processing unit may be used to send messages to patrons. These messages may be specific or general. For example, the system might be used to inform patrons of a change in library hours or to tell a patron that an item placed on hold has arrived. In addition, broadcast facilities could be used to send lists of new acquisitions to interested patrons.

In addition to these formal user-system interactions, the interactive features of the online catalog may also be used to support user-to-user communications. In this way, patrons may not only send a request for information to library staff members, but could also send a request for information to other library users. This informal communication may be exceedingly useful to library patrons, especially in corporate or academic settings where the so-called "invisible college" may be able to provide more timely access to information than is possible via formal channels of information transfer. This combination of formal and informal communication could also be used to encourage patrons to add comments or to write reviews of materials

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they have read. Of course such wide-open systems carry with them the danger of unverified information and incautious remarks, but the benefits could far outweigh the risks. Few research results are available on this topic, but as more systems become available that can support these types of formal and informal communication between online data files and their users, more will become known about the best ways to manage these new features.

--5. The partnership of microcomputers and telecommunications gives users access to information, no matter where it is located. Although the various online search services such as Dialog and BRS provide access to a wide variety of databases in machine-readable form, in the past most users had to consult a librarian or other intermediary to establish the link to the remote database, provide the password, and execute the search. For the first time, the microcomputer-telecommunications partnership makes it possible for users to search these collections directly, without any need to work through a search intermediary. Further, in some systems, where Local Area Nets have been installed that serve as gateway systems, users can search more than one online database. For example, a library patron might be able to locate citations for materials in the library's online catalog, then move to a search of a related file of abstracts and get a set of citations for journal articles, then move to a file of the full text of newspaper articles and so forth. Finally, using the local storage capabilities of the microcomputer the patron could assemble a single bibliography incorporating entries from each of these sources.

Although telecommunications charges still force users to be aware that getting data that are stored far away may be more expensive

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than getting data that are located close at hand, some systems normalize charges over both source and distance, so that the patron pays one price for each search regardless of where the data are located and the hourly charge for the database use. Some of these systems charge for each citation displayed or downloaded as well as charging a flat fee for each search performed.

The goal is to reach the point that users pay a price for information that is insensitive to distance and to the inherent charges for using each database. In an academic environment this is especially important because students who are working in disciplines whose databases are very expensive should not be penalized for that interest. In addition, students in California should not necessarily have to pay more to search a database located in New York than a New Yorker would.

Microcomputers make it much easier to establish these friendly telecommunications protocols or gateways, because much of the programming needed to establish the connections, monitor the charges, and assist users in moving from one database or file to another can be made to run on the microcomputer. As microcomputers become more powerful and less expensive, their capabilities can be used to good advantage to assist the user in gaining access to information scattered over a large number of sources in a wide variety of locations.

Having the telecommunications capabilities available with the microcomputer makes it possible for the patron to connect to data files and information sources all over the world. Furthermore, this extremely powerful combination of hardware and software is available at relatively low cost. Costs keep spiraling downwards, but in mid-1986 a microcomputer-based system could be acquired for well under \$2000 which would provide almost limitless capabilities for accessing

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information, downloading it, editing and refining it, and sharing it with other users.

Conclusion

Microcomputers used with online catalogs will change how catalogs are used by allowing these systems to be tailored much more closely to meet particular needs, both the needs of the library and the needs of its users. This paper has briefly described how microcomputers can be used to provide direct access for library patrons, ending the need to work through a librarian or other search intermediary. Microcomputers make it possible to distribute the intelligence in the system, allowing for more sophisticated (and friendly!) user interfaces and more efficient processing. Advances in data storage technology coupled with enhanced microcomputer capabilities make it possible to distribute the data in these systems as well. Thus, an online catalog system may access data stored locally, regionally, or nationally and can adjust where these data are stored to optimize the data storage/telecommunications cost tradeoff. Because microcomputers can be programmed and have local storage available, patrons can now use them to work with data files in new ways. Electronic mail, bulletin board, and other new features can be used to support many new activities. Both formal and informal communication can be encouraged, thus enriching the use of information resources. Finally, the microcomputer-telecommunications partnership that is now available for a relatively low cost is revolutionizing the way people get information. The "library without walls" is becoming a reality, and for many library users, information is as close as the nearest telephone.

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